EXTRACTS from VARSITY PREP MATHS by JOHN WEBB

BASIC ARITHMETIC PROBLEMS

1. 728×125 is equal to

(A) 91 000 (B) 92 600 (C) 78 500 (D) 93 000 (E) 89 500

8. Which of the following statements is true?

(A) $11^8 < 2^{28} < 5^{12}$
(B) $2^{28} < 11^8 < 5^{12}$
(C) $11^8 < 5^{12} < 2^{28}$
(D) $5^{12} < 11^8 < 2^{28}$
(E) $2^{28} < 5^{12} < 11^8$

BASIC ALBEBRA PROBLEMS

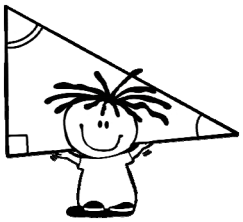
6. When $(3x^2 - 2x + 6)(x^2 - 4x + 7)(x^2 + 3x - 1)$ is multiplied out to the form $ax^6 + bx^5 + cx^4 + dx^3 + ex + f$, what is the value of $a + b + c + d + e + f$?

(A) 84 (B) 96 (C) 72 (D) 108 (E) 120

8. The sum $\sum_{n=1}^{\infty}\left(\frac{2}{3}\right)^n$ is equal to:

(A) $\frac{3}{2}$ (B) 2 (C) $\frac{2}{3}$ (D) 3 (E) 6

BASIC GEOMETRY PROBLEMS



2. The length of the hypotenuse of a right-angled isosceles triangle is a. What is the area of the triangle?

(A) $\frac{1}{4}a^2$ (B) $a^2\sqrt{2}$ (C) $\frac{1}{2}a^2$ (D) $\frac{1}{\sqrt{2}}a^2$ (E) a^2

10. A vertical stick of length 108 cm casts a shadow of length 72 cm. Next to it is another vertical stick of length 84 cm. What is the length of the shadow of the second stick?

(A) 48 cm (B) 54 cm (C) 56 cm (D) 60 cm (E) 72 cm

PROBLEMS 1

8. If $\frac{1}{x} + \frac{1}{y} = 12$ and $x + y = 3$, the value of xy is

(A) $\frac{1}{4}$ (B) 1 (C) 2 (D) 4 (E) 12

15. In a maths test, the average mark for the boys was 53.3% and the average mark for the girls was 56.1%. The average mark for the whole class was 54,8%. What was the ratio of boys to girls in the class?

(A) $\frac{13}{15}$ (B) $\frac{11}{16}$ (C) $\frac{5}{7}$ (D) $\frac{16}{19}$ (E) $\frac{9}{10}$

PROBLEMS 2

5. In the grade 12 maths class there are three boys for every two girls. The average age of the boys is 14 years and 2 months, and the average age of the girls is 13 years and 4 months. What is the average age of the whole class?

(A) 13 years and 6 months
(B) 13 years and 8 months
(C) 13 years and 10 months
(D) 13 years and 9 months
(E) Not enough information has been given.

6. A square has sides of length 2. What is the sum of the distances from one vertex of the square to the midpoints of each of the four sides?

(A) $2 + \sqrt{3}$ (B) $2 + 2\sqrt{3}$ (C) $2 + \sqrt{5}$ (D) $2 + 2\sqrt{5}$ (E) $2\sqrt{5}$

PROBLEMS 3

5. The area of a circle is decreased by 51%. By what amount is the radius decreased?

(A) 30% (B) 45% (C) 49% (D) 51% (E) 25.5%

8. A rectangle is cut into three squares each with a perimeter of 30. What is the perimeter of the rectangle?

(A) 90 (B) 84 (C) 75 (D) 60 (E) 56

PROBLEMS 4

14. In quadrilateral ABCD, AB and DC are parallel with AB = 11 and CD = 7. The point E lies on AB such that the area of triangle AED is equal to the area of quadrilateral BCDE.

    Determine the ratio AE : EB.

    (A) 5 : 1 (B) 4 : 1 (C) 9 : 2 (D) 11 : 3 (E) 2 : 1

19. Two circles, of radii 35 and 15, intersect, and their common tangents meet at an angle of 60°. What is the distance between the centres of the circles?

    (A) 20 (B) 30 (C) 40 (D) 50 (E) 60

PROBLEMS 5

4. The roots of the equation $x^2 - 2x - 7 = 0$ are a and b. Which of the following equations has roots $a + 1$ and $b + 1$?

    (A) $x^2 - 3x - 8 = 0$ (B) $x^2 - x - 6 = 0$ (C) $x^2 - 4x - 4 = 0$
    (D) $x^2 + 2x - 8 = 0$ (E) $x^2 + 2x - 5 = 0$

5. In triangle ABC, with AB = c, BC = a and CA = b,

$$\frac{4 \times \text{Area ABC}}{b^2 + c^2 - a^2}$$

    is equal to

    (A) cos A (B) tan A (C) sin 2A (D) $\frac{1}{2}\cos A$ (E) 2sin A

PROBLEMS 6

15. A car leaves Cape Town for Beaufort West at 2 p.m., travelling at 65 kilometres an hour. At the same time another car leaves Beaufort West for Cape Town, travelling at 85 kilometres an hour. If Beaufort West is 500 kilometres from Cape Town, when do they meet?

    (A) 5:10 p.m. (B) 5:20 p.m. (C) 5:30 p.m. (D) 5:40 p.m. (E) 5:50 p.m.

18. The angles of a triangle are in the ratio 2 : 3 : 5. What is the difference between the largest and the smallest angle?

    (A) 9° (B) 18° (C) 36° (D) 45° (E) 54°

PROBLEMS 7

11. $\left(1+\frac{1}{a-1}\right)\left(1+\frac{1}{a}\right)\left(1+\frac{1}{a+1}\right)$ is equal to

(A) $1+\frac{1}{a+2}$ (B) $1+\frac{3}{a-1}$ (C) $1+\frac{1}{3a}$ (D) $1+\frac{1}{a^3-a^2}$ (E) $1+\frac{2}{a}$

15. Simplify: $\frac{9^n+8.3^n+12}{3^{n+1}+6}$

(A) $3^n + 10$ (B) $3^{n-1} + 2$ (C) $3^{n-2} + 1$ (D) $3^n + 1$ (E) $3^{n+1} + 6$

PROBLEMS 8

9. A square barn with sides of length 8 m stands in the middle of a large grassy field. A horse is tethered by a rope 6 metres long to a post in the centre of one side of the barn. What area of
the field (in square metres) is the horse able to graze?

(A) 20π (B) 22π (C) 24π (D) 26π (E) 30π

11. If r is a root of the equation $r^2 + 5r + 3 = 0$, what is the value of $(r^2 + 3)(r + 5)$?

(A) 17 (B) 24 (C) $4\sqrt{13}$ (D) 13 (E) 15

PROBLEMS 9

2. A car travels x km on a litre of petrol and petrol costs y rands per litre. The cost of the petrol, in rands, for a journey of z km, is

(A) $\frac{yz}{x}$ (B) $\frac{xz}{y}$ (C) $\frac{xy}{z}$ (D) xyz (E) $\frac{xyz}{x+y+z}$

14. If $3 \le m \le 10$ and $12 \le n \le 21$, then the difference between the largest and smallest possible values of $\frac{m}{n}$ is

(A) $\frac{29}{42}$ (B) $\frac{29}{5}$ (C) $\frac{19}{70}$ (D) $\frac{19}{12}$ (E) $\frac{19}{84}$

PROBLEMS 10

3. $\left(3^3+4^3+5^3\right)^{\frac{1}{3}}$ is equal to

(A) 6 (B) 8 (C) 9 (D) 10 (E) 12

19. A boy runs from his home to school at 8 km/h, then walks back home at 6 km/h. What was his average speed, to one decimal place, for the trip to school and back?

(A) 6,4 km/h (B) 6,7 km/h (C) 6,8 km/h (D) 6,9 km/h (E) 7,0 km/h

ANSWERS

Basic Arithmetic Problems	1 A	8 C
Basic Algebra Problems	6 A	8 B
Basic Geometry Problems	2 A	10 C
Problems 1	8 A	15 A
Problems 2	5 C	6 D
Problems 3	5 A	8 D
Problems 4	14 C	19 C
Problems 5	4 C	5 B
Problems 6	15 B	18 E
Problems 7	11 B	15 B
Problems 8	9 A	11 E
Problems 9	2 A	14 A
Problems 10	3 A	19 D

Website addresses relevant to the NBTs

UCT links:

Preparing your LEARNERS for the NBTs

Exemplar Questions for the Mathematics (MAT) NBT

Exemplar Questions and solutions for Academic and Quantitative Literacy (AQL)

OLICO Maths links (Free online and printable resources for MAT and AQL)

Online MAT NBT Tests

Free, downloadable, printable MAT NBT Practice booklet

AQL (Academic and Quantitative Literacy)

Helpful resources

Varsity Maths Prep 101 (available through The Answer Series)

- **skills you need to succeed in Maths 101**
- **great preparation for the NBTs**

Use this QR code
to access the solutions

EXTRACTS from VARSITY PREP MATHS by JOHN WEBB SOLUTIONS

BASIC ARITHMETIC PROBLEMS

1. 728×125 is equal to

(A) 91 000 (B) 92 600 (C) 78 500 (D) 93 000 (E) 89 500

Easy calculation approach

$$125 = \frac{8 \times 125}{8} = \frac{1\,000}{8} = \frac{1}{8}(1\,000)$$

$$728 \times 125 = 728 \times \frac{1\,000}{8} = {}^{91}\cancel{728} \times \frac{1\,000}{{}_{1}\cancel{8}} = 91 \times 1\,000 = 91\,000$$

8. Which of the following statements is true?

(A) $11^8 < 2^{28} < 5^{12}$
(B) $2^{28} < 11^8 < 5^{12}$
(C) $11^8 < 5^{12} < 2^{28}$
(D) $5^{12} < 11^8 < 2^{28}$
(E) $2^{28} < 5^{12} < 11^8$

Strategy

Express each base with the same exponent, so start by finding the HCF of 8, 12 and 28.

$8 = 4 \times 2$

$12 = 4 \times 3$

$28 = 4 \times 7$

$2^{28} = 2^{7 \times 4} = (2^7)^4 = 128^4$

$5^{12} = 5^{3 \times 4} = (5^3)^4 = 125^4$

$11^8 = 11^{2 \times 4} = (11^2)^4 = 121^4$

$121^4 < 125^4 < 128^4$

$\therefore\ 11^8 < 5^{12} < 2^{28}$

BASIC ALBEBRA PROBLEMS

6. When $(3x^2 - 2x + 6)(x^2 - 4x + 7)(x^2 + 3x - 1)$ is multiplied out to the form $ax^6 + bx^5 + cx^4 + dx^3 + ex + f$, what is the value of a + b + c + d + e + f?

(A) 84 (B) 96 (C) 72 (D) 108 (E) 120

Consider the following:

$$ax^6 + bx^5 + cx^4 + dx^3 + ex + f = (3x^2 - 2x + 6)(x^2 - 4x + 7)(x^2 + 3x - 1)$$

a, b, c, d, e and f are constant, so they are not affected by the value of x.

Substitute $x = 1$:

$$\therefore\ a + b + c + d + e + f = (3 - 2 + 6)(1 - 4 + 7)(1 + 3 - 1) = (7)(4)(3) = 84$$

8. The sum $\sum_{n=1}^{\infty}\left(\frac{2}{3}\right)^n$ is equal to:

(A) $\frac{3}{2}$ (B) 2 (C) $\frac{2}{3}$ (D) 3 (E) 6

Routine work:

$$\frac{2}{3};\ \frac{4}{9};\ \frac{8}{27};\ldots$$

$$a = \frac{2}{3} \text{ and } r = \frac{2}{3}$$

$$\therefore S_\infty = \frac{a}{1-r} = \frac{\frac{2}{3}\times 3}{\left(1 - \frac{2}{3}\right)\times 3} = \frac{2}{3-2} = 2$$

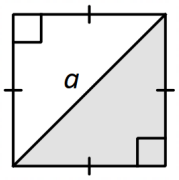
BASIC GEOMETRY PROBLEMS

2. The length of the hypotenuse of a right-angled isosceles triangle is a.
What is the area of the triangle?

(A) $\frac{1}{4}a^2$ (B) $a^2\sqrt{2}$ (C) $\frac{1}{2}a^2$ (D) $\frac{1}{\sqrt{2}}a^2$ (E) a^2

Use a diagram to make sense of this question.

The area of any right-angled isosceles triangle is half the area of a square with the same length sides, as shown alongside.



Using the diagonals, the area of a square

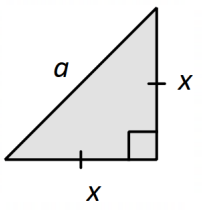
$= \frac{1}{2}$ the product of the diagonals

$= \frac{1}{2}a^2$

$\therefore$ the area of the triangle $= \frac{1}{2}\left(\frac{1}{2}a^2\right) = \frac{1}{4}a^2$

or

Let the sides of the triangle be x units.



$\therefore\ 2x^2 = a^2$ (Pythag)

$\therefore\ x^2 = \frac{1}{2}a^2$

Area $\Delta = \frac{1}{2}x^2 = \frac{1}{2}\left(\frac{1}{2}a^2\right) = \frac{1}{4}a^2$

10. A vertical stick of length 108 cm casts a shadow of length 72 cm. Next to it is another vertical stick of length 84 cm. What is the length of the shadow of the second stick?

(A) 48 cm (B) 54 cm (C) 56 cm (D) 60 cm (E) 72 cm

Routing question, asked differently.

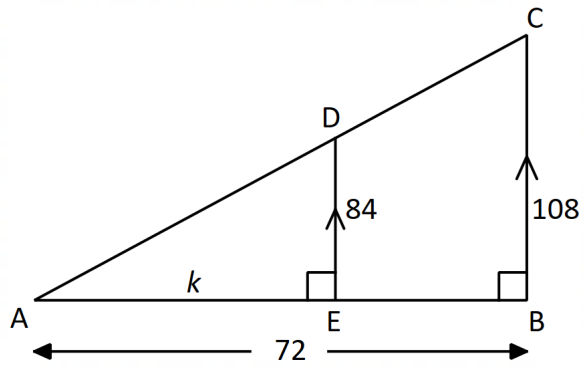
$AED \text{ ||| } \Delta\Delta ABC$ (AAA)

$\therefore\ \frac{AE}{AB} = \frac{AD}{AC} = \frac{ED}{BC}$ ($|||\ \Delta s$)

$\therefore\ \frac{K}{72} = \frac{84}{108}$

$\therefore\ 108k = 72 \times 84$

$\therefore\ k = \frac{9 \times 8 \ \times \ 12 \times 7}{12 \times 9} = 56$



PROBLEMS 1

8. If $\frac{1}{x} + \frac{1}{y} = 12$ and $x + y = 3$, the value of xy is

(A) $\frac{1}{4}$ (B) 1 (C) 2 (D) 4 (E) 12

Note that you do not need to find the value of x or y.

$$\frac{1}{x}+\frac{1}{y}=12$$

$$\therefore \quad \frac{y+x}{xy}=12$$

$$\therefore \quad 12xy = x+y = 3$$

$$\therefore \quad xy=\frac{3}{12}=\frac{1}{4}$$

15. In a maths test, the average mark for the boys was 53.3% and the average mark for the girls was 56.1%. The average mark for the whole class was 54,8%. What was the ratio of boys to girls in the class?

(A) $\frac{13}{15}$ (B) $\frac{11}{16}$ (C) $\frac{5}{7}$ (D) $\frac{16}{19}$ (E) $\frac{9}{10}$

Once again, you don't need to solve for x or y.

Let the number of boys be x and let the number of girls by y.

$$\frac{53,3x+56,1y}{x+y}=54,8$$

$$\therefore \quad 53,3x+56,1y=54,8(x+y)$$

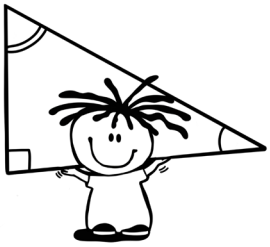
$$\therefore \quad 53,3x+56,1y=54,8x+54,8y$$

$$\therefore \quad 56,1y-54,8y=54,8x-53,3x$$

$$\therefore \quad 1,3y=1,5x$$

$$\therefore \quad \frac{1,3}{1,5}=\frac{x}{y}$$

$$\therefore \quad x:y=13:15$$



PROBLEMS 2

5. In the grade 12 maths class there are three boys for every two girls. The average age of the boys is 14 years and 2 months, and the average age of the girls is 13 years and 4 months. What is the average age of the whole class?

(A) 13 years and 6 months
(B) 13 years and 8 months
(C) 13 years and 10 months
(D) 13 years and 9 months
(E) Not enough information has been given.

Let the number of girls be $2x$.
$\therefore$ the number of boys $3x$.
The average age of the whole class can be calculated in months or in years

The average age, working in months

$$= \frac{3x(14\times 12+2)+2x(13\times 12+4)}{5x}$$

$$= \frac{3(10\times 12+4\times 12+2)+2(10\times 12+3\times 12+4)}{5}$$

$$= \frac{3(120+48+2)+2(120+36+4)}{5}$$

$$= \frac{3(170)+2(160)}{5}$$

$$= \frac{510+320}{5}$$

$$= \frac{830}{5}$$

$$= 166 \text{ months}$$

$$= \frac{166}{12} \text{ years}$$

$$= 13 \text{ years } 10 \text{ months}$$

The average age, working in years

$$= \frac{3x\left(14\frac{1}{6}\right)+2x\left(13\frac{1}{3}\right)}{5x}$$

$$= \frac{42+\frac{1}{2}+26+\frac{2}{3}}{5}$$

$$= \frac{240+12+3+120+36+4}{30}$$

$$= \frac{415}{30}$$

$$= \frac{83}{6}$$

$$= 13\frac{5}{6}$$

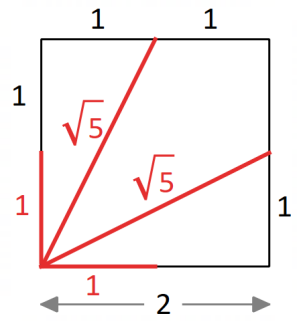
$$= 13 \text{ years } 10 \text{ months}$$

PROBLEMS 2

6. A square has sides of length 2. What is the sum of the distances from one vertex of the square to the midpoints of each of the four sides?

(A) $2 + \sqrt{3}$ (B) $2 + 2\sqrt{3}$ (C) $2 + \sqrt{5}$ (D) $2 + 2\sqrt{5}$ (E) $2\sqrt{5}$

Use a diagram to make sense of this question.



The sum of the four lengths
$= 2 + 2\sqrt{5}$

PROBLEMS 3

5. The area of a circle is decreased by 51%. By what amount is the radius decreased?

(A) 30% (B) 45% (C) 49% (D) 51% (E) 25.5%

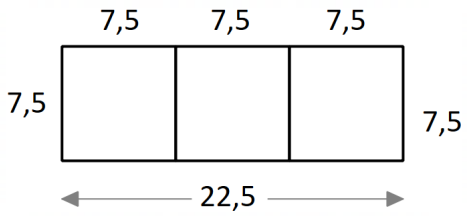
The area of a circle $= \pi r^2$
If the area of the circles decreases by 51%, then 49% of the area is retained.
$0,49 \times \pi r^2 = \pi \times (0,7r)^2$
The radius is 0,7 of its original length, so it has decreased by 0,3 of its original length.

$\therefore$ radius is decreased by 30%.

8. A rectangle is cut into three squares each with a perimeter of 30. What is the perimeter of the rectangle?

(A) 90 (B) 84 (C) 75 (D) 60 (E) 56

The perimeter of the rectangle
$= 2(7,5) + 2(22,5)$
$= 15 + 45$
$= 60$

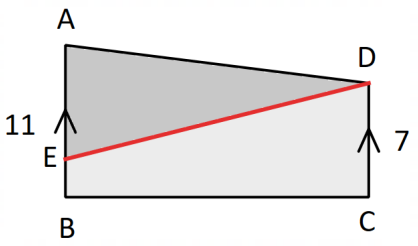


PROBLEMS 4

14. In quadrilateral ABCD, AB and DC are parallel with AB = 11 and CD = 7. The point E lies on AB such that the area of triangle AED is equal to the area of quadrilateral BCDE.

Determine the ratio AE : EB.

(A) 5 : 1 (B) 4 : 1 (C) 9 : 2 (D) 11 : 3 (E) 2 : 1



$$\text{Area } \Delta AED = \frac{1}{2} AE \times h$$

$$\text{Area } AECD = \frac{1}{2} h(BE + 7) = \frac{1}{2} h(11 - AE + 7) = \frac{1}{2} h(18 - AE)$$

$$\text{Area } \Delta AED = \text{Area } AECD$$

$$\therefore \frac{1}{2} AE \times h = \frac{1}{2} h(18 - AE)$$

$$AE = 18 - AE$$

$$2AE = 18$$

$$\therefore AE = 9$$

AE : EB = 9 : 2

19. Two circles, of radii 35 and 15, intersect, and their common tangents meet at an angle of 60°. What is the distance between the centres of the circles?

(A) 20 (B) 30 (C) 40 (D) 50 (E) 60

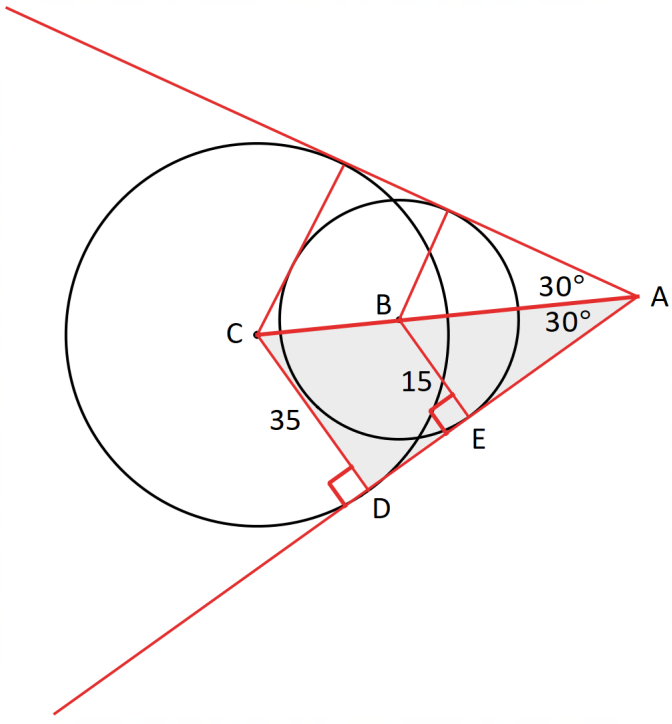
$$\sin 30° = \frac{35}{AC} = \frac{1}{2}$$

$$\therefore AC = 70$$

$$\sin 30° = \frac{15}{AB} = \frac{1}{2}$$

$$\therefore AB = 30$$

$$CB = AC - AB = 70 - 30 = 40$$



PROBLEMS 5

4. The roots of the equation $x^2 - 2x - 7 = 0$ are a and b. Which of the following equations has roots $a + 1$ and $b + 1$?

(A) $x^2 - 3x - 8 = 0$ (B) $x^2 - x - 6 = 0$ (C) $x^2 - 4x - 4 = 0$
(D) $x^2 + 2x - 8 = 0$ (E) $x^2 + 2x - 5 = 0$

If each root increases by 1, then the equation changes as follows:

$$(x-1)^2 - 2(x-1) - 7 = 0$$

$$\therefore\ x^2 - 2x + 1 - 2x + 2 - 7 = 0$$

$$\therefore\ x^2 - 4x - 4 = 0$$

The roots of the given equation: $x = 1 \pm 2\sqrt{2}$

Roots of new equation: $x = 2 \pm 2\sqrt{2}$

New equation: $\left(x - 2 - 2\sqrt{2}\right)\left(x - 2 + 2\sqrt{2}\right) = 0$

$$\therefore\ (x-2)^2 - 8 = 0$$

$$\therefore x^2 - 4x - 4 = 0$$

5. In triangle ABC, with AB = c, BC = a and CA = b,

$$\frac{4 \times \text{Area ABC}}{b^2 + c^2 - a^2}$$

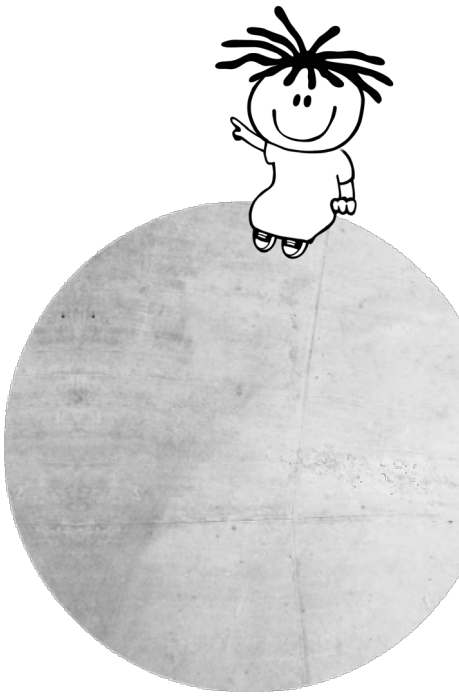
is equal to

(A) cos A (B) tan A (C) sin 2A (D) $\frac{1}{2}\cos A$ (E) 2sin A

Area rule with $\hat{A}$: Area $\Delta ABC = \frac{1}{2}bc\sin A$

Cos rule with $\hat{A}$: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

$$\frac{4\text{area } \Delta ABC}{b^2 + c^2 - a^2} = \frac{4\left(\frac{1}{2}bc\sin A\right)}{2bc\cos A} = \frac{\sin A}{\cos A} = \tan A$$



PROBLEMS 6

15. A car leaves Cape Town for Beaufort West at 2 p.m., travelling at 65 kilometres an hour. At the same time another car leaves Beaufort West for Cape Town, travelling at 85 kilometres an hour. If Beaufort West is 500 kilometres from Cape Town, when do they meet?

(A) 5:10 p.m. (B) 5:20 p.m. (C) 5:30 p.m. (D) 5:40 p.m. (E) 5:50 p.m.

In hour they cover 65 + 85 = 150 km

In 2 hours they cover 300 km

In 3 hours they cover 450 km

The remaining 50km takes 20 minutes (or $\frac{1}{3}$ hour)

They meet after 3 hours 20 minutes at 5:20 p.m.

18. The angles of a triangle are in the ratio 2 : 3 : 5. What is the difference between the largest and the smallest angle?

(A) 9° (B) 18° (C) 36° (D) 45° (E) 54°

$2:3:5 = 2x:3x:5x$

$\therefore\ 10x = 180°$

$\therefore\ x = 18°$

The angles are $36°,\ 54°$ and $90°$.

$\therefore$ the difference beteen the largest and smallest angles = $90° - 36° = 54°$

PROBLEMS 7

11. $\left(1+\frac{1}{a-1}\right)\left(1+\frac{1}{a}\right)\left(1+\frac{1}{a+1}\right)$ is equal to

(A) $1+\frac{1}{a+2}$ (B) $1+\frac{3}{a-1}$ (C) $1+\frac{1}{3a}$ (D) $1+\frac{1}{a^3-a^2}$ (E) $1+\frac{2}{a}$

$$\left(1+\frac{1}{a-1}\right)\left(1+\frac{1}{a}\right)\left(1+\frac{1}{a+1}\right)$$

$$=\left(\frac{a-1+1}{a-1}\right)\left(\frac{a+1}{a}\right)\left(\frac{a+1+1}{a+1}\right)$$

$$=\left(\frac{{}^{1}\cancel{a}}{a-1}\right)\left(\frac{{}^{1}\cancel{a+1}}{{}^{1}\cancel{a}}\right)\left(\frac{a+2}{{}^{1}\cancel{a+1}}\right)$$

$$=\frac{a+2}{a-1}$$

$$=\frac{a-1+3}{a-1}$$

$$=\frac{a-1}{a-1}+\frac{3}{a-1}$$

$$=1+\frac{3}{a-1}$$

15. Simplify: $\frac{9^n+8.3^n+12}{3^{n+1}+6}$

(A) 3^n+10 (B) $3^{n-1}+2$ (C) $3^{n-2}+1$ (D) 3^n+1 (E) $3^{n+1}+6$

$$\frac{9^n+8.3^n+12}{3^{n+1}+6}=\frac{(3^n+2)(3^n+6)}{3(3^n+2)}=\frac{3^n+6}{3}$$

PROBLEMS 8

9. A square barn with sides of length 8 m stands in the middle of a large grassy field. A horse is tethered by a rope 6 metres long to a post in the centre of one side of the barn. What area of
the field (in square metres) is the horse able to graze?

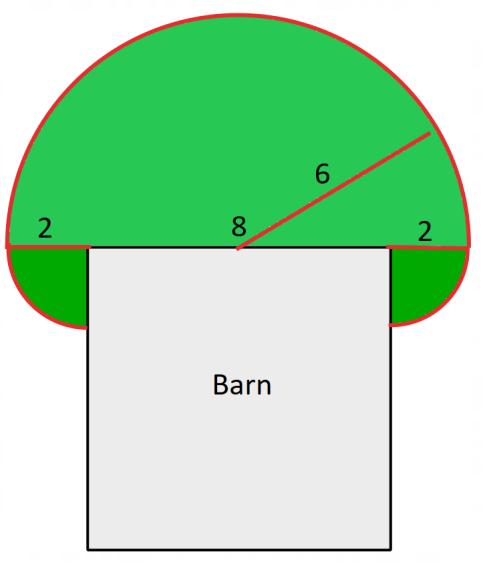
(A) 20π (B) 22π (C) 24π (D) 26π (E) 30π

Area of field horse can graze

$$=2\left(\frac{\pi(2)^2}{4}\right)+\frac{\pi(6)^2}{2}$$

$$=2\pi+18\pi$$

$$=20\pi$$



11. If r is a root of the equation $r^2 + 5r + 3 = 0$, what is the value of $(r^2 + 3)(r + 5)$?

(A) 17 (B) 24 (C) $4\sqrt{13}$ (D) 13 (E) 15

$$r^2+5r+3=0$$

$$\therefore\ (r^2+3)(r+5)=r^3+5r^2+3r+15=r(r\ +5r+3)+15=r(0)+15=15$$

PROBLEMS 9

2. A car travels x km on a litre of petrol and petrol costs y rands per litre. The cost of the petrol, in rands, for a journey of z km, is

(A) $\frac{yz}{x}$ (B) $\frac{xz}{y}$ (C) $\frac{xy}{z}$ (D) xyz (E) $\frac{xyz}{x+y+z}$

$$\text{Cost of petrol} = \frac{\text{Number of km travelled}}{\text{Number of km travelled per per litre of petrol}} \times \text{cost of petrol per litre}$$

$$= \frac{z}{x} \times y$$

$$= \frac{zy}{x}$$

$$= \frac{yz}{x}$$

14. If $3 \leq m \leq 10$ and $12 \leq n \leq 21$, then the difference between the largest and smallest possible values of $\frac{m}{n}$ is

(A) $\frac{29}{42}$ (B) $\frac{29}{5}$ (C) $\frac{19}{70}$ (D) $\frac{19}{12}$ (E) $\frac{19}{84}$

m and n are both positive.

Largest possible value of $\frac{m}{n}$ is $\frac{10}{12} = \frac{5}{6}$.

Smallest possible value of $\frac{m}{n}$ is $\frac{3}{21} = \frac{1}{7}$

The difference between the largest and smallest values of $\frac{m}{n}$ is $\frac{5}{6} - \frac{1}{7} = \frac{35-6}{42} = \frac{29}{42}$.

PROBLEMS 10

3. $\left(3^3+4^3+5^3\right)^{\frac{1}{3}}$ is equal to

(A) 6 (B) 8 (C) 9 (D) 10 (E) 12

$$\left(3^3+4^3+5^3\right)^{\frac{1}{3}} = (27+64+125)^{\frac{1}{3}} = 216^{\frac{1}{3}} = 6$$

19. A boy runs from his home to school at 8 km/h, then walks back home at 6 km/h. What was his average speed, to one decimal place, for the trip to school and back?

(A) 6,4 km/h (B) 6,7 km/h (C) 6,8 km/h (D) 6,9 km/h (E) 7,0 km/h

$$= \frac{\text{total distance}}{\text{total time}}$$

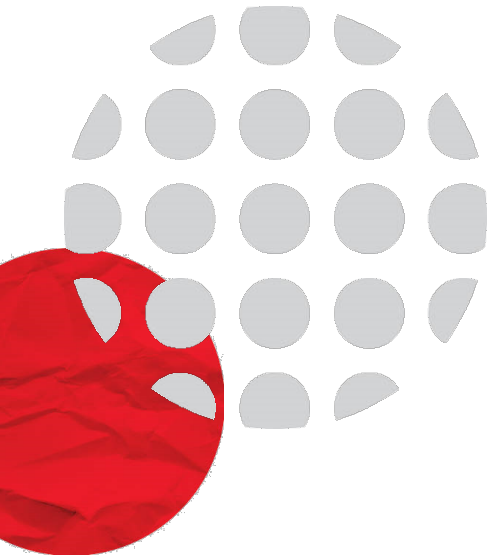
$$= \frac{2d \times 24}{\left(\frac{d}{8}+\frac{d}{6}\right)\times 24}$$

Average speed $= \frac{48d}{3d+4d}$

$$= \frac{48d}{7d}$$

$$= 6{,}85...\text{km/h}$$

$$\approx 6{,}9 \text{ km/h}$$



ANSWERS

Basic Arithmetic Problems	1 A	8 C
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Basic Geometry Problems	2 A	10 C
Problems 1	8 A	15 A
Problems 2	5 C	6 D
Problems 3	5 A	8 D
Problems 4	14 C	19 C
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Problems 6	15 B	18 E
Problems 7	11 B	15 B
Problems 8	9 A	11 E
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