

PART A Mathematics

- 1 Find the complete set of solutions to $-8 < 6 - \frac{x}{2}$
- A $x < 4$
 - B $x > 4$
 - C $x < 20$
 - D $x > 20$
 - E $x < 22$
 - F $x > 22$
 - G $x < 28$
 - H $x > 28$
- 2 Which one of the following is a simplification of $(\sqrt{3} - \sqrt{2})^2$?
- A $1 - 2\sqrt{3}\sqrt{2}$
 - B $5 - 2\sqrt{2}\sqrt{3}$
 - C $2\sqrt{3} - 2\sqrt{2}$
 - D 1
 - E $5 - \sqrt{2}\sqrt{3}$
 - F $13 - 2\sqrt{2}\sqrt{3}$
 - G $5 + 2\sqrt{2}\sqrt{3}$
 - H 5

- 3** The ratio of Q:R is 5:2 and the ratio of R:S is 3:10

Which one of the following gives the ratio Q:S in its simplest form?

- A** 1:2
- B** 2:1
- C** 3:4
- D** 3:25
- E** 4:3
- F** 25:3

- 4** The mean age of the twenty members of a running club is exactly 28.

The mean age increases by exactly 2 years when two new members join.

What is the mean age of the two new members?

- A** 20 years
- B** 22 years
- C** 30 years
- D** 40 years
- E** 50 years
- F** 52 years

- 5** A medical scanner is bought for £15 000.

The value of the scanner depreciates by 20% every year.

By how much has the scanner reduced in value after 2 years?

- A** £600
- B** £3000
- C** £5400
- D** £6000
- E** £9000
- F** £9600
- G** £12 000

- 6** The point A is 4 km due East of the point B.

The bearing of the point C from A is 330° and the bearing of C from B is 060°

Find the distance BC.

- A** 2 km
- B** $2\sqrt{3}$ km
- C** 4 km
- D** $2\sqrt{5}$ km
- E** $4\sqrt{2}$ km

- 7 The quantities x and y are positive.

x is inversely proportional to the square root of y .

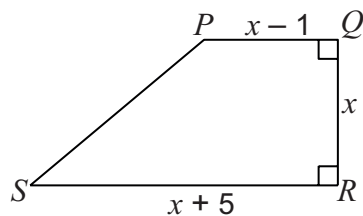
When $x = 8$, $y = 9$.

What is the value of y when $x = 6$?

- A $\frac{3}{2}$
- B 2
- C $\frac{81}{16}$
- D $\frac{27}{14}$
- E 12
- F 16

- 8 In a trapezium $PQRS$, the parallel sides are PQ and RS .

$PQ = (x - 1)$ cm, $RS = (x + 5)$ cm and the vertical height $QR = x$ cm.



[diagram not to scale]

The area of the trapezium is 120 cm^2 .

What is the length of RS ?

- A 9 cm
- B 10 cm
- C 11 cm
- D 12 cm
- E 15 cm
- F 17 cm

- 9 Make b the subject of the formula:

$$a = \frac{b^2 + 2}{3b^2 - 1}$$

A $b = \pm \sqrt{\left(\frac{a+2}{3a+1}\right)}$

B $b = \pm \sqrt{\left(\frac{a+2}{3a-1}\right)}$

C $b = \pm \sqrt{\left(\frac{2-a}{3a+1}\right)}$

D $b = \pm \sqrt{\left(\frac{2-a}{3a-1}\right)}$

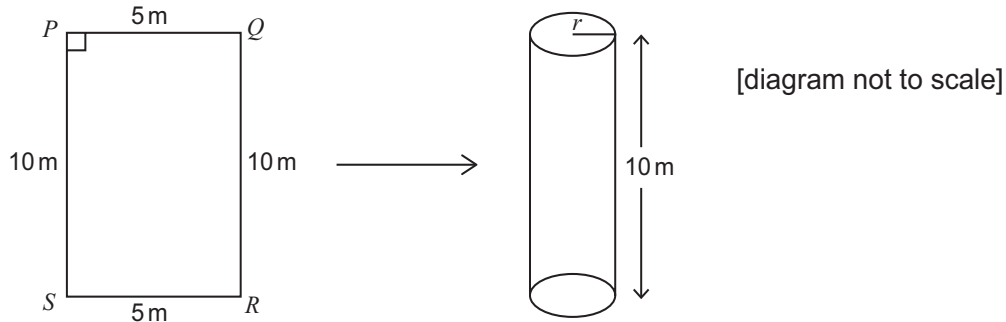
E $b = \pm \sqrt{\left(\frac{3}{3a+1}\right)}$

F $b = \pm \sqrt{\left(\frac{3}{3a-1}\right)}$

- 10** A thin rectangular sheet of metal 10 m by 5 m is made into an open ended cylinder by joining the edges PS and QR .

The height of the cylinder is 10 m.

What is the volume, in cubic metres, enclosed by this cylinder?



- A** $\frac{5}{2\pi}$
- B** $\frac{25}{4\pi}$
- C** $\frac{125}{2\pi}$
- D** 62.5π
- E** $\frac{125}{\pi}$
- F** 250π
- 11** Which one of the following is a simplification of $4 + \frac{4-x^2}{x^2-2x}$?

- A** $3 - \frac{2}{x}$
- B** $3 + \frac{2}{x}$
- C** $4 - \frac{2}{x}$
- D** $4 + \frac{2}{x}$
- E** $5 - \frac{2}{x}$
- F** $5 + \frac{2}{x}$

- 12** During summer activities week 120 students each chose one activity from swimming, archery, and tennis.

46 of the students were girls.

36 of the students chose tennis, and $\frac{2}{3}$ of these were boys; 25 girls chose swimming, and 27 students chose archery.

A boy is picked at random. What is the probability that he chose swimming?

- A** $\frac{3}{20}$
- B** $\frac{9}{37}$
- C** $\frac{4}{15}$
- D** $\frac{16}{37}$
- E** $\frac{32}{57}$

- 13** Which one of the following expressions is equivalent to $\frac{9^{2n+1} \times 3^{4-3n}}{27^{2-n}}$?

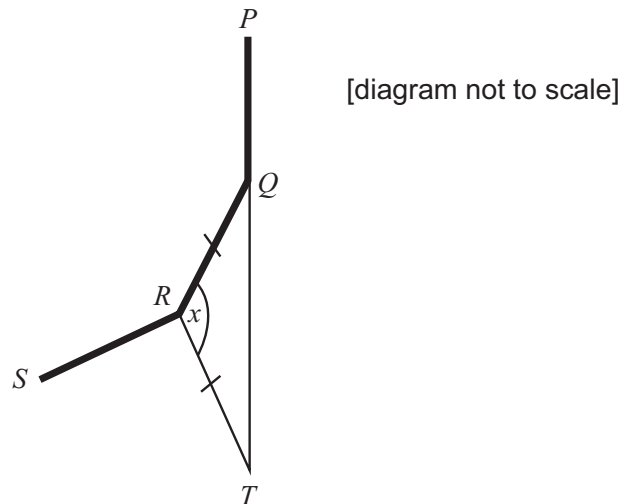
- A** 3^9
- B** 3^{-2n}
- C** 3^{2-2n}
- D** 3^{4n}
- E** 3^{6n-2}
- F** 3^6

- 14** In the diagram below, $PQRS$ is part of a regular polygon.

The polygon has n sides.

The side PQ is extended to T such that PQT is a straight line.

The length of RQ is the same as the length of RT .



Find an equation for n in terms of x , where x is the size of angle $\angle QRT$ in degrees.

- A** $n = \frac{180}{x-90}$
- B** $n = \frac{180-x}{720}$
- C** $n = \frac{360-x}{90}$
- D** $n = \frac{360}{180-x}$
- E** $n = \frac{720}{180-x}$
- F** $n = \frac{720}{360-x}$
- G** $n = \frac{360}{360-x}$

- 15** In a population, $\frac{3}{5}$ of the adults are overweight.

The probability of an overweight adult having Type 2 diabetes is $\frac{9}{50}$; this probability is 6 times the probability of an adult who is not overweight having the disease.

An adult is chosen at random from the population.

What is the probability the chosen adult has Type 2 diabetes?

- A** $\frac{27}{250}$
- B** $\frac{3}{25}$
- C** $\frac{63}{500}$
- D** $\frac{37}{250}$
- E** $\frac{39}{50}$
- F** $\frac{21}{100}$

- 16** The graph of $y = x^2 + ax + b$ meets the straight line $y = x + 1$ when $x = 2$ and $x = 4$.

Find a and b .

- A** $a = -5, b = 9$
- B** $a = 5, b = 9$
- C** $a = -5, b = 11$
- D** $a = 5, b = 11$
- E** $a = -6, b = 11$
- F** $a = 6, b = 11$
- G** $a = -6, b = 13$
- H** $a = 6, b = 13$

- 17** A rhombus has diagonals of length 5 cm and 3 cm.

An enlargement of the rhombus has sides of length $\sqrt{68}$ cm.

What is the scale factor of the enlargement?

- A** $\sqrt{2}$
- B** 2
- C** $2\sqrt{2}$
- D** 4
- E** $4\sqrt{2}$

- 18** A straight line is drawn joining the points with coordinates $(7, 1 - p)$ and $(2p + 1, -1)$, where p is a constant.

What is the complete set of values of p for which the gradient of this line is finite and greater than zero?

- A** $p < -4, p > 0$
- B** $-4 < p < 0$
- C** $p < 0$
- D** $p < 2$
- E** $2 < p < 3$
- F** $p < 2, p > 3$