Oxford Cambridge and RSA

# GCSE (9-1) Mathematics

**J560/05** Paper 5 (Higher Tier)

## Question Set 1

**1.** **(a)** Simplify fully.

$$\frac{3a^8 \times 2a^5}{a^2} = \frac{3a^8 \times 2a^{\cancel{5}\,3}}{\cancel{a^2}} = 3a^8 \times 2a^3 = \boxed{6a^{11}}$$

**(a)** $6a^{11}$ **[3]**

**(b)** Solve.

$$\frac{6x-10}{5} = 1 \quad (\times 5)$$

$$6x - 10 = 5$$

$$6x = 5 + 10$$

$$\frac{\cancel{6}x}{\cancel{6}} = \frac{\cancel{15}^{5}}{\cancel{6}_{2}}$$

$$\boxed{x = \frac{5}{2}}$$

**(b)** $x =$ $\frac{5}{2}$ **[3]**

**2.** **(a)** A sunflower grows at a rate of 4 cm each day.

How many days does it take to grow from a height of 80 cm to more than 1.06 m?

day = $x$ rate = 4 cm / day 1.06 m = 106 cm

$4 \times x > 106 - 80 = 26$

$\frac{4x}{4} > \frac{26}{4}$

$x > 6.5$ days → whole number greater than 6.5 = 7

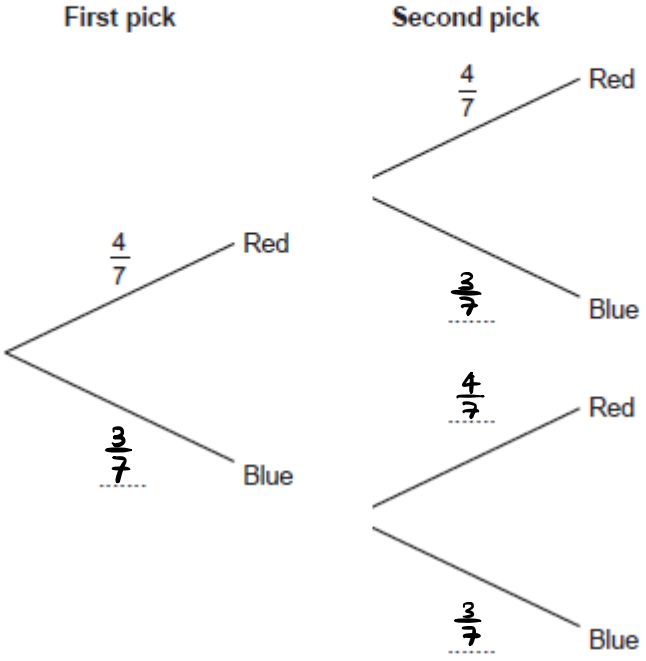
**(a)** 7 days **[3]**

**(b)** If the sunflower grows at a faster rate, how would this affect your answer to part **(a)**?

The number of days required would decrease **[1]**

**3.** A bag contains 4 red counters and 3 blue counters only.
Jack picks a counter at random and then replaces it.
Jack then picks a second counter at random.

**(a)** Complete the tree diagram.




**[2]**

**(b)** Work out the probability that Jack picks two red counters.

$\frac{4}{7} \times \frac{4}{7} = \frac{16}{49}$

$\frac{16}{49}$

**(b)** ..... **[2]**

**4.** Mrs Mills buys 4 packs of treats for her cats, Fluff and Tigger.

She gives Fluff $\frac{1}{6}$ of a pack each day.

She gives Tigger $\frac{1}{5}$ of a pack each day.

For how many complete days will the 4 packs of treats last?

per day : $\frac{1}{6} + \frac{1}{5} = \frac{5+6}{30} = \frac{11}{30}$

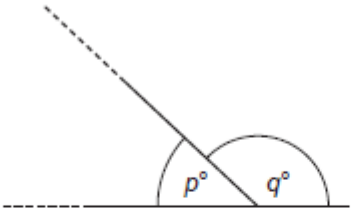
4 packs $\Rightarrow 4 \times 30 \Rightarrow \frac{120}{30}$

$120 \div 11 = 10.\dot{9}\dot{0}$ days

10 days

..... [5]

**5.** An interior angle of an isosceles triangle is $p°$ and an exterior angle is $q°$.




Not to scale

It is given that $q = 5p$.

**(a)** Write the ratio $p : q$ in its simplest form.

$p : 5p = 1 : 5$

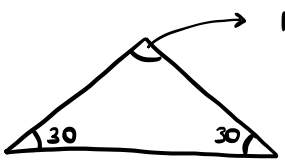
**(a)** 1 : 5 **[2]**

**(b)** Work out the two different possible sets of angles for the isosceles triangle.

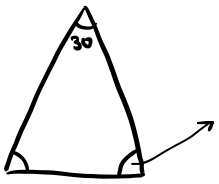
$p + 5p = 180$

$6p = 180$

$p = 30°$




$180 - 30 - 30$
$= 120°$




$180 - 30 = 150$
$150 \div 2 = 75°$

**(b)** Triangle 1: 30°, 30°, 120°

Triangle 2: 30°, 75°, 75°

**[4]**

6. **(a)** Write $\frac{1}{6}$ as a recurring decimal.

$\frac{1}{6} \times \frac{15}{15} = \frac{15}{90} = \frac{16-1}{90}$ or

$\Rightarrow 1.\dot{6} \Rightarrow 0.1\dot{6}$

$0.166\ldots \Rightarrow 0.1\dot{6}$

$6 \overline{)1\,0}$, $6$, $40$, $36$, $40$

(a) $0.1\dot{6}$ **[2]**

**(b)** Elsa divides a two-digit number by another two-digit number.
She gets the answer $0.1\dot{5}$.

She says that there is only one possible pair of numbers that will give this answer.
Is she correct? Show how you decide.

$100x = 15.555\ldots$
$-\ 10x = 1.555\ldots$
$90x = 14$
$x = \frac{14}{90}$

$\frac{14}{90} \div 2 \Rightarrow \frac{7}{45}$ ← not two-digit

$\frac{14}{90} \times 2 \Rightarrow \frac{28}{810}$ ← not two-digit

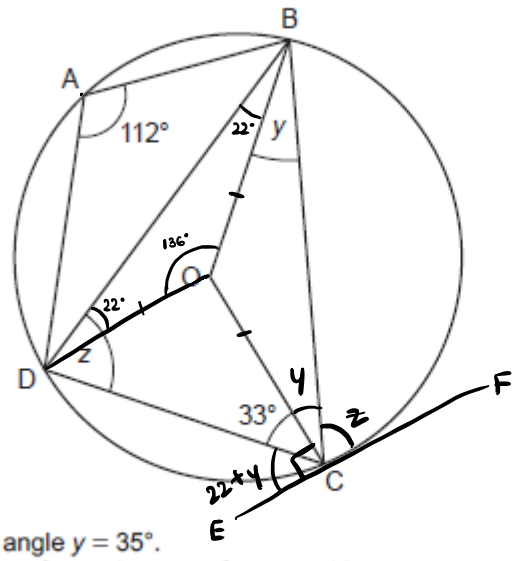
$\therefore$ so $\frac{14}{90}$ is the only possible pair of numbers

Yes, she is correct

**[4]**

**7.** A, B, C and D are points on the circumference of a circle, centre O.

Angle BAD = 112° and angle DCO = 33°.




Not to scale

**(a)** Show that angle $y = 35°$.
Give reasons for each stage of your working. **[4]**

$112 \times 2 = 224 \quad 360 - 224 = 136 = \angle DOB$

$\overline{DO} = \overline{BO}$ thus $\angle BDO = \angle OBD = \frac{180 - 136}{2} = 22$

The tangent ($\overline{EF}$) is perpendicular to $\overline{OC}$ radius

$\angle DBC = \angle DCE = 22 + y$

$22 + y + 33 = 90$

$y + 55 = 90$

$\boxed{y = 35°}$

**(b)** Work out angle z.
Give reasons for your answer.

$\angle BDC = \angle BCF = z \qquad y = 35$

$\angle OCF = 90 = y + z = 35 + z$

$\boxed{z = 55°}$

Angle z = 55 ° because according to alternate segment theorem $\angle BDC = \angle BCF = z°$ and the angle between the tangent ($\overline{EF}$) and the radius ($\overline{OC}$) is 90° which is equal to $y + z$ **[3]**

8. **(a)** Write $x^2+8x+3$ in the form $(x+a)^2-b$.

$(x+a)^2 = x^2+2ax+a^2$

$x^2 + 2\times4x + 3 \qquad a = 4$

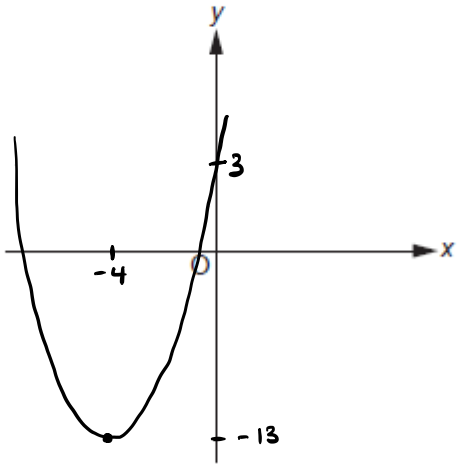
$= x^2 + 2\times4x + 4^2 - 4^2 + 3$

$= (x+4)^2 - 16 + 3$

$= (x+4)^2 - 13$

**(a)** $(x+4)^2-13$ **[3]**

**(b)** Sketch the graph of $y=x^2+8x+3$.
Show clearly the coordinates of any turning points and the $y$-intercept.




**[4]**

y-intercept : $y = 0^2 + 8\times0 + 3 \qquad x = 0$

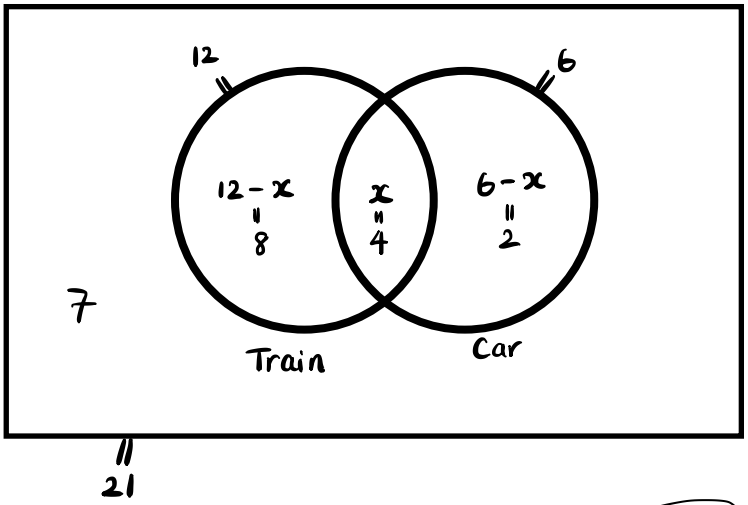
$y = 3$

**9.** 21 people travelled to a meeting.

- 12 used a train.
- 6 used a car.
- 7 did not use a train or a car.
- Some used a train and a car.

Two people are chosen at random from those who used a train.

Find the probability that both these people also used a car.




$(12-x)+x+(6-x)+7=21$

$25-x=21$

$25-21=x$

$x=4$

$\frac{4}{12} \times \frac{3}{11} = \frac{1}{11}$

$\frac{1}{11}$ ..... [6]

## Total Marks for Question Set 1: 51