Name:

Exam Style Questions

Solving Equations: Fractional (advanced)

Corbettmaths

Equipment needed: Pen, Calculator

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Video Tutorial

www.corbettmaths.com/contents

Video 111a

Answers and Video Solutions

1. Solve

$$\frac{2}{x}+\frac{2}{x+3}=1$$

$$\frac{2(x+3)+2x}{x(x+3)}=1$$

$$\frac{2x+6+2x}{x(x+3)}=1$$

$$4x+6=x(x+3)$$

$$4x+6=x^2+3x$$

$$0=x^2-x-6$$

$$0=(x-3)(x+2)$$

$x=3$ or $x=-2$

$x=3$ or $x=-2$

(and) **(5)**

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2. Solve

$$\frac{1}{x+3}+\frac{6}{x+7}=1$$

$$\frac{x+7+6(x+3)}{(x+3)(x+7)}=1$$

$$\frac{x+7+6x+18}{(x+3)(x+7)}=1$$

$$7x+25=(x+3)(x+7)$$

$$7x+25=x^2+10x+21$$

$$0=x^2+3x-4$$

$$0=x^2+3x-4$$

$$0=(x+4)(x-1)$$

$x=-4$ or $x=1$

$x=-4$ or $x=1$

(and) **(5)**

3. Solve

$$\frac{1}{x+3}+\frac{3}{1-x}=2$$

$$\frac{1-x+3(x+3)}{(x+3)(1-x)}=2$$

$$\frac{1-x+3x+9}{(x+3)(1-x)}=2$$

$$2x+10=2(x+3)(1-x)$$

$$2x+10=2(x-x^2+3-3x)$$

$$2x+10=2(3-2x-x^2)$$

$$2x+10=6-4x-2x^2$$

$$2x^2+6x+4=0$$

$$x^2+3x+2=0$$

$$(x+2)(x+1)=0$$

$x=-2$ or $x=-1$

$x=-2$ or $x=-1$

(cont'd) **(5)**

4. Solve

$$\frac{7}{x}-\frac{2}{x+2}=3$$

$$\frac{7(x+2)-2x}{x(x+2)}=3$$

$$\frac{7x+14-2x}{x(x+2)}=3$$

$$5x+14=3x(x+2)$$

$$5x+14=3x^2+6x$$

$$0=3x^2+x-14$$

$$0=(3x+7)(x-2)$$

$$(3x+7)(x-2)=0$$

$3x+7=0$ $\quad x=2$

$3x=-7$

$x=-\frac{7}{3}$

$x=-\frac{7}{3}$ or $x=2$

(cont'd) **(5)**

5. Solve

$$\frac{7}{x+2}+\frac{10}{2x-5}=3$$

$$\frac{7(2x-5)+10(x+2)}{(x+2)(2x-5)}=3$$

$$\frac{14x-35+10x+20}{(x+2)(2x-5)}=3$$

$$24x-15=3(x+2)(2x-5)$$

$$8x-5=(x+2)(2x-5)$$

$$8x-5=2x^2-x-10$$

$$0=2x^2-9x-5$$

$$0=(x-5)(2x+1)$$

$x=5$ or $x=-\frac{1}{2}$

$x=5$ or $x=-\frac{1}{2}$ (and)

(5)

6. Solve, giving your answers to 1 decimal place.

$$\frac{1}{2x+1}+\frac{4}{x-2}=1$$

$$\frac{x-2+4(2x+1)}{(2x+1)(x-2)}=1$$

$$\frac{x-2+8x+4}{(2x+1)(x-2)}=1$$

$$9x+2=(2x+1)(x-2)$$

$$9x+2=2x^2-3x-2$$

$$0=2x^2-12x-4$$

$$0=x^2-6x-2$$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$a=1$ $b=-6$ $c=-2$

$$x=\frac{6\pm\sqrt{(-6)^2-(4\times1\times-2)}}{2}$$

$$x=\frac{6\pm\sqrt{36-(-8)}}{2}$$

$$x=\frac{6\pm\sqrt{44}}{2}$$

$x=\frac{6+\sqrt{44}}{2}$ or $x=\frac{6-\sqrt{44}}{2}$

$x=6.3$ or $x=-0.3$ (and)

(6)

7. Solve, giving your answers to 2 decimal places.

$$\frac{5}{x+1}+\frac{3}{x+4}=\frac{2}{3}$$

$$\frac{5(x+4)+3(x+1)}{(x+1)(x+4)} = \frac{2}{3}$$

$$\frac{5x+20+3x+3}{(x+1)(x+4)} \not= \frac{2}{3}$$

$$\frac{8x+23}{(x+1)(x+4)} \not= \frac{2}{3}$$

$$24x+69 = 2(x+1)(x+4)$$

$$24x+69 = 2[x^2+5x+4]$$

$$24x+69 = 2x^2+10x+8$$

$$0 = 2x^2-14x-61$$

$a=2 \quad b=-14 \quad c=-61$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{14 \pm \sqrt{196-(-488)}}{4}$$

$$x = \frac{14 \pm \sqrt{684}}{4}$$

$$x = \frac{14 \pm 6\sqrt{19}}{4}$$

$$x = \frac{14+6\sqrt{19}}{4} \text{ or } x = \frac{14-6\sqrt{19}}{4}$$

$x = 10.038...$ or $x = -3.038...$

$x = 10.04$ or $x = -3.04$

(cont'd) **(6)**

8. Solve

$$\frac{1}{x+1}+\frac{2}{x}=5$$

Give your answer in the form $\frac{p \pm \sqrt{q}}{5}$ where p and q are integers.

$\frac{x + 2(x+1)}{x(x+1)} = 5$

$\frac{x + 2x + 2}{x^2 + x} = 5$

$3x + 2 = 5x^2 + 5x$

$0 = 5x^2 + 2x - 2$

$a = 5 \quad b = 2 \quad c = -2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-2 \pm \sqrt{4 - (4 \times 5 \times -2)}}{10}$

$x = \frac{-2 \pm \sqrt{4 - (-40)}}{10}$

$x = \frac{-2 \pm \sqrt{44}}{10}$

$x = \frac{-2 \pm \sqrt{4} \times \sqrt{11}}{10}$

$x = \frac{-2 \pm 2\sqrt{11}}{10}$

$x = \frac{-1 \pm \sqrt{11}}{5}$

$x = \frac{-1 + \sqrt{11}}{5}$ or $x = \frac{-1 - \sqrt{11}}{5}$ (and)

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(6)

9. Solve

$$\frac{9}{4x-1} = \frac{4}{7} + \frac{3}{x+2}$$

$$\frac{9}{4x-1} = \frac{4(x+2)+21}{7(x+2)}$$

$$\frac{9}{4x-1} = \frac{4x+8+21}{7x+14}$$

$$\frac{9}{4x-1} = \frac{4x+29}{7x+14}$$

$$9(7x+14) = (4x+29)(4x-1)$$

$$63x+126 = 16x^2+112x-29$$

$$0 = 16x^2+49x-155$$

$$0 = (16x-31)(x+5)$$

$$x = \frac{31}{16} \text{ (and) } x = -5$$

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(6)

10. Solve, giving your answers to 1 decimal place.

$$\frac{x}{1+4x}+\frac{3}{x-1}=2$$

$$\frac{x(x-1)+3(1+4x)}{(1+4x)(x-1)}=2$$

$$x^2-x+3+12x=2(1+4x)(x-1)$$

$$x^2+11x+3=2(x-1+4x^2-4x)$$

$$x^2+11x+3=2(4x^2-3x-1)$$

$$x^2+11x+3=8x^2-6x-2$$

$$0=7x^2-17x-5$$

$a=7 \quad b=-17 \quad c=-5$

$$x=\frac{17\pm\sqrt{289-(-140)}}{14}$$

$$x=\frac{17\pm\sqrt{429}}{14}$$

$x=2.7$ or $x=-0.3$ (and)

to 1 dp

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(6)

11. Solve, giving your answers to 1 decimal place.

$$\frac{2x-1}{x} - \frac{4}{x+2} = 5$$

$$\frac{(2x-1)(x+2) - 4x}{x(x+2)} = 5$$

$$2x^2 + 3x - 2 - 4x = 5x(x+2)$$

$$2x^2 - x - 2 = 5x^2 + 10x$$

$$0 = 3x^2 + 11x + 2$$

$a = 3 \quad b = 11 \quad c = 2$

$$x = \frac{-11 \pm \sqrt{121 - 24}}{6}$$

$$x = \frac{-11 \pm \sqrt{97}}{6}$$

$$x = \frac{-11 + \sqrt{97}}{6} \quad \text{or} \quad x = \frac{-11 - \sqrt{97}}{6}$$

$x = -0.2$ or $x = -3.5$ (and)

to 1dp

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(6)

12. Solve, giving your answers to 2 decimal places.

$$\frac{x-4}{x+5} - \frac{3x-2}{x+1} = 1$$

$$\frac{(x-4)(x+1) - (3x-2)(x+5)}{(x+5)(x+1)} = 1$$

$$x^2 - 3x - 4 - (3x^2 + 13x - 10) = (x+5)(x+1)$$

$$-2x^2 - 16x + 6 = x^2 + 6x + 5$$

$$0 = 3x^2 + 22x - 1$$

$$a = 3 \quad b = 22 \quad c = -1$$

$$x = \frac{-22 \pm \sqrt{484 - (-12)}}{6}$$

$$x = \frac{-22 \pm \sqrt{496}}{6}$$

$$x = 0.05 \quad \text{or} \quad x = -7.38$$

$x = -7.38$ or $x = 0.05$ (both)

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